Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_

**Honors Chemistry Unit Test 1 Study Guide**

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| --- | --- | --- | --- |
| *Content* | * Particle diagrams/writing chemical formulas * Chemical/physical properties and changes * Pure substance/element/compound/heterogeneous mixture/homogeneous mixture (solution) * Separation of mixtures * Atomic structure (subatomic particles’ charge/mass/location, etc.) * Atomic calculations for neutral atoms and ions * Average atomic mass and percent abundance * Electron configuration and orbital diagrams (including three rules) * Quantum number theory and determining quantum numbers | | |
| *Test Format* | Multiple choice  Short answer   * Average atomic mass calculations * Electron configuration/orbital diagrams * Quantum numbers * Written responses | | |
| *Labs* | Chemical vs. physical changes  Separation of mixtures  Flame test | | |
| *Vocabulary* | Angular momentum quantum number (ℓ)  Atom  Atomic mass  Atomic mass unit (amu)  Atomic number  Aufbau principle  Average atomic mass  Bohr  Chemical change  Chemical property  Compound  Corrosiveness  Electron  Electron configuration  Element  Energy level  Excited state | Flame test  Flammability  Ground state  Heterogeneous mixture  Homogeneous mixture  Hund’s rule  Ion  Isotope  Magnetic quantum number **(**mℓ**)**  Mass number  Matter  Neutral atom  Neutron  Nucleus  Orbital  Orbital diagram  Pauli exclusion principle | Physical change  Physical property  Principle quantum number (n)  Proton  Pure substance  Quantum number  Reactivity  Relative abundance  Solubility  Solution  Spin quantum number (ms)  Subatomic particle  Subshell/sublevel  Two types of isotope notation ( and Carbon-12) |

**Unit 1 Practice Problems**

1. **Give two examples of each of the following:**

|  |  |
| --- | --- |
| **Type of Matter** | **Examples** |
| Element |  |
|  |
| Compound |  |
|  |
| Heterogeneous mixture |  |
|  |
| Homogeneous mixture |  |
|  |

1. **Classify each of the following diagrams by placing the correct label in the blanks below:**

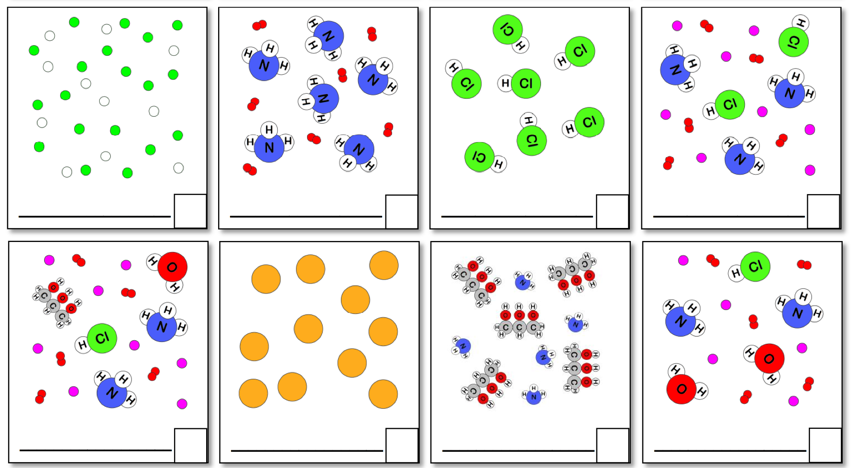
A = element

B = compound

C = mixture of elements

D = mixture of compounds

E = mixture of elements and compounds



1. What is the BIGGEST difference between a chemical change and a physical change?
2. **Below is a list of things that might happen during a chemical or physical change. Write a P next to the signs of a physical change and a C next to the signs of a chemical change.**
3. \_\_\_\_\_\_\_ New substance created
4. \_\_\_\_\_\_\_ Fizzing/foaming
5. \_\_\_\_\_\_\_ Phase change
6. \_\_\_\_\_\_\_ Shape/size change
7. \_\_\_\_\_\_\_ Flames/burning
8. \_\_\_\_\_\_\_ Something dissolving
9. \_\_\_\_\_\_\_ Gas produced
10. **Real life examples. Write a P next to the signs of a physical change and a C next to the signs of a chemical change.**
11. \_\_\_\_\_\_\_ Tearing a piece of paper
12. \_\_\_\_\_\_\_ Cooking eggs
13. \_\_\_\_\_\_\_ Dissolving salt in water
14. \_\_\_\_\_\_\_ Boiling water
15. \_\_\_\_\_\_\_ Crushing metal
16. \_\_\_\_\_\_\_ Melting ice
17. \_\_\_\_\_\_\_ Burning wood
18. **True-False** Classify each of the following statements as always true, **AT**; sometimes true, **ST**; or never true, **NT**.

\_\_\_\_\_ 1. Atoms are composed of protons, electrons, and neutrons.

\_\_\_\_\_ 2. Atoms of elements are neutral.

\_\_\_\_\_ 3. The mass of an electron is equal to the mass of a neutron.

\_\_\_\_\_ 4. The charge on all protons is the same.

\_\_\_\_\_ 5. The atomic number of an element is the sum of the protons and electrons in the atom.

\_\_\_\_\_ 6. The atomic number of an element is the whole number that decreases as you read across each row of the periodic table from left to right.

\_\_\_\_\_ 7. An atom of nitrogen has 7 protons and 7 neutrons.

\_\_\_\_\_ 8. The number of neutrons in the nucleus can be calculated by subtracting the atomic number from the mass number.

1. Complete the following table. All atoms are NEUTRAL (#protons = #electrons).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Element** | **Atomic Number** | **Mass Number** | **Number of Protons** | **Number of Neutrons** | **Number of Electrons** |
| Fluorine | 9 |  |  | 10 |  |
|  |  |  |  | 21 | 20 |
|  | 13 | 27 |  |  |  |
|  |  | 56 | 26 |  |  |

1. Which of these statements is false?

**a.** Electrons have a negative charge.

**b.** Electrons have a mass of 1 amu.

**c.** The nucleus of an atom is positively charged.

**d.** The neutron is found in the nucleus of an atom.

1. An atom of an element with atomic number 48 and atomic mass 120 contains

**a.** 48 protons, 48 electrons, and 72 neutrons.

**b.** 72 protons, 48 electrons, and 48 neutrons.

**c.** 120 protons, 48 electrons, and 72 neutrons.

**d.** 72 protons, 72 electrons, and 48 neutrons.

Which element is this? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. All atoms of the same element have the same:

**a.** number of protons.

**b.** number of neutrons.

**c.** atomic mass.

**d.** mass.

1. Which of these statements is *not* true?

**a.** Atoms of the same element can have different atomic masses.

**b.** The nucleus of an atom has a positive charge.

**c.** Isotopes of an element have different numbers of protons.

**d.** Atoms are mostly empty space.

**Ions**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Isotope Symbol | Atomic Number | Mass Number | # of protons | # of neutrons | # of electrons |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Element** | **Atomic Number** | **# Protons** | **# Electrons** | **Charge** | **Isotope Symbol** |
| O atom that has gained 2 electrons |  |  |  |  | -2 |
| K atom that has lost 1 electron |  |  |  |  |  |
| Mg atom that has lost 2 electrons |  |  |  |  |  |
| F atom that has gained 1 electron |  |  |  |  |  |
| N atom that has gained 3 electrons |  |  |  |  |  |
| Sr atom that has lost 2 electrons |  |  |  |  |  |

**Electron Configuration**

Identify the following elements based on their electron configurations.

1. 1s22s2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. 1s22s22p63s23\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. 1s1 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. 1s22s22p63s23\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

In the space below, write the electron configurations of the following elements:

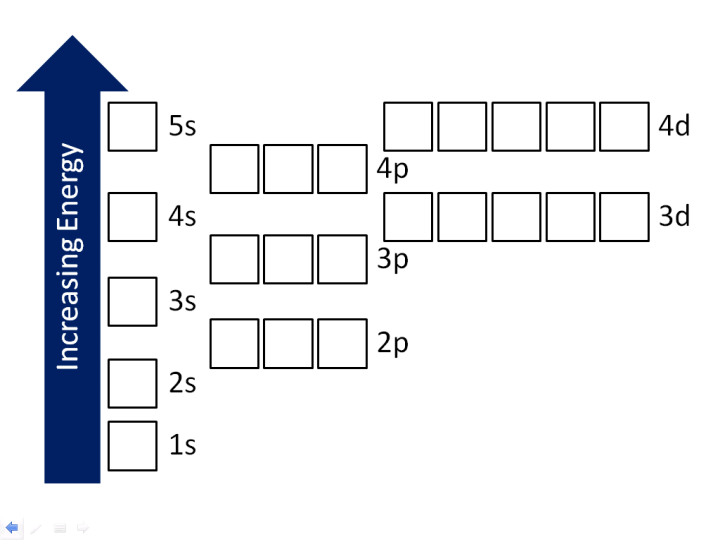
2) iron (full) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3) bromine (full) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4) barium (abbreviated) \_\_\_\_\_\_\_\_\_\_\_\_\_

**Phosphorous** has \_\_\_\_\_ electrons.

Unabbreviated electron configuration: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Uranium is used in nuclear reactors and is a rare element on earth. Uranium has three common isotopes. If the abundance of 234U is 0.01%, the abundance of 235U is 0.71%, and the abundance of 238U is 99.28%, what is the average atomic mass of uranium?

The average atomic mass of Thallium is 204.3833 amu. The masses for the two stable isotopes are 202.9723 amu for thallium-203 and 204.9744 amu for thallium-205. Calculate the percent abundance of each isotope.

Identify the element whose highest energy electron would have the following four quantum numbers:

11. 3, 1, -1, +1/2\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

12. 4, 2, +1, +1/2\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

13. 6, 1, 0, -1/2\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

14. 4, 3, +3, -1/2\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

15. 2, 1, +1, -1/2\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Which of the following represents a permissible set of quantum numbers? (answer “yes” if permissible and “no” if no permissible)

16. 2, 2, +1, -1/2\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

17. 5, 1, 0, +1/2\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

18. 6, 3,-2, +1/2\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

19. 7, 0, 0, -1/2\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

20. 4, 1, 8, +1/2\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The quantum number n describes the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of an atomic orbital.

The shape of an atomic orbital is given by the quantum number \_\_\_\_\_\_\_\_\_.

The maximum number of orbitals that may be associated with the set of quantum numbers n=4 and ℓ=3 is \_\_\_\_\_\_\_.